Annals of Clinical and Analytical Medicine

Original Research

Relationship between mNUTRIC score and 28-day mortality in critical patients

mNUTRIC score and 28-day mortality in critical patients

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Abstract

Aim: In this study, we aimed to investigate the effect of the modified NUTRIC score on 28-day mortality in critical patients in the internal medicine intensive care unit.

Material and Methods: A retrospective review of patients in the intensive care unit between 01.10.2019 and 01.03.2020 was carried out. The study included patients aged >18 years, treated for more than twenty-four hours in the Intensive Care Unit, with mechanical ventilation for more than 48 hours. Patient demographic data, length of stay in the internal medicine intensive care unit, and the modified NUTRIC score were recorded. Patients were separated into two groups according to the calorie sufficiency calculated in the first 5 days as those receiving <70% energy or >70% energy.

Results: One hundred twenty-eight patients were examined. Supportive treatment of vasopressor drugs was applied to 34 (26.6%) patients, renal replacement therapy to 35 (27.3%) and mechanical ventilation to 71.8% of the patients. The 28-day survival rate was determined to be statistically significantly low in the group with a high mNUTRIC score (p:0.044). The time spent on mechanical ventilation was determined to be statistically significantly longer in the group receiving >70% energy (p<0.05).

Discussion: The higher rate of 28-day mortality in patients in the medicine intensive care unit was determined to be related to the higher mNUTRIC score. When >70% of the daily calorie requirement was administered to patients on a mechanical ventilator, the number of days spent on mechanical ventilation was high.

Keywords

Intensive Care Units, Mortality, Nutritional Status

DOI: 10.4328/ACAM.21085 Received: 2022-01-27 Accepted: 2022-03-07 Published Online: 2022-04-07 Printed: 2022-06-01 Ann Clin Anal Med 2022;13(6):669-673

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Introduction

Adequate nutrition is very important for critical patients in the intensive care unit (ICU). However, the heterogeneity of critical patients means that not all patients will respond equally to nutritional treatment [1].

The provision of adequate nutrition is standard care for critical patients expected to remain in the intensive care unit for more than 48 hours [2].

A lengthy stay in the intensive care unit is a reason for malnutrition together with loss of skeletal muscle mass and function, and can lead to diminished the quality of life, weakness and morbidity in the long term after discharge from the intensive care unit [3].

Rates of inadequate nutrition have been reported to be extremely high in ICU patients compared with the general hospital population [4]. Infectious and non-infectious complications and reduced functional strength resulting from inadequate nutrition have been reported to be associated with a longer duration of stay in hospital and increase hospital costs [5,6].

Various methods are used to assess the risk of malnutrition [7]. The first scoring system to be used was the Nutrition Risk in the Critically Ill (NUTRIC) score, which was developed by Heyland et al for the evaluation of intensive care unit patients and includes comorbidities, reduced energy intake, body mass index, and prognosis markers. Interleukin-6, which is used as a marker of inflammation, and so it is possible to calculate the modified NUTRIC (mNUTRIC) score without using IL-6. Risk groups are defined as low (0-4) or high (5-9) according to the mNUTRIC score, and high-risk groups have been associated with poor prognosis [8].

In this study, we aimed to investigate the effect of mNUTRIC score on 28-day mortality in critically ill patients admitted to our intensive care unit.

Material and Methods

This retrospective study was conducted in the Internal Diseases ICU of Afyonkarahisar Health Sciences University Medical Faculty Hospital between 01.10.2019 and 01.03.2020. Approval for the study was granted by the University Clinical Research Ethics Committee (decision no:73, dated: 2020). All procedures were applied in compliance with the principles of the Helsinki Declaration.

The study included patients aged >18 years, in the intensive care unit for more than 24 hours and patients applied with a mechanical ventilator for more than 48 hours. Patients who developed mortality and those discharged from intensive care unit within 24 hours were not included in the study. At 24 hours after admission to the intensive care unit, enteral nutrition (EN) of 25 kcal (kg.d) was started. If the patient had enteral intolerance or contraindication for EN, parenteral nutrition (PN) support was given. A residual gastric volume was checked every 12 hours, and if <500mL, the nutrition was continued and if >500 mL, the nutritional support was terminated. Calorie intake was calculated for 5 days. The calorie sufficiency of patients was separated into 2 groups as those receiving <70% or >70% of the energy requirement calculated for the first 5 days. Calorie sufficiency (%) was calculated as (5-day calorie intake/ 5-day calorie requirement) x 100.

The nutritional risk status of the patients was defined using the 9-point mNUTRIC score. Those with a score of 0-4 were evaluated as low risk and those with a score of 5-9 as high risk of malnutrition, which has been associated with poor clinical results [9].

Statistical analysis

The conformity of continuous variables to normal distribution was assessed with the Shapiro-Wilk and Kolmogorov-Smirnov tests. Continuous variables were stated as mean±standard deviation (SD) values if showing normal distribution and as median and interquartile range values if distribution was not normal. Categorical data were stated as number (n) and percentage (%). The Chi-square test was applied in the comparisons of categorical variables. The Independent Samples t-test was used for comparisons of continuous variables with normal distribution and the Mann-Whitney U-test for those not showing normal distribution. The Kaplan-Meier method was applied in survival analysis. The factors affecting survival were examined with the Log Rank test.

Results

The mean age of the patients evaluated was 63.4±12 years, and the mean body mass index was 25.5±4.8 kg/m2. Vasopressor drugs were used by 34 (26.6%) patients, renal replacement therapy (RRT) by 35 (27.3%), and 92 (71.8%) received mechanical ventilator (MV) support. The median length of stay in intensive care unit was 12 days (IQR: 8-20), and the mean hospital stay before admission to ICU was 6 days. APACHE II score was calculated as a mean value of 20.1±6.1. Characteristics of all the patients and of the patients with MV, are shown according to 28-day mortality in Table 1. In both groups, the mNUTRIC score of patients with mortality was found to be significantly higher than that of surviving patients (p<0.05). The rates of vasopressor use and RRT were determined to be significantly higher in the patients with mortality compared to the surviving patients in both groups (p<0.05).

The 28-day survival of patients classified according to the mNUTRIC score is represented in graph form in Figure 1. The 28-day survival rates of patients with a high mNUTRIC score were determined to be significantly low (p:0.044).

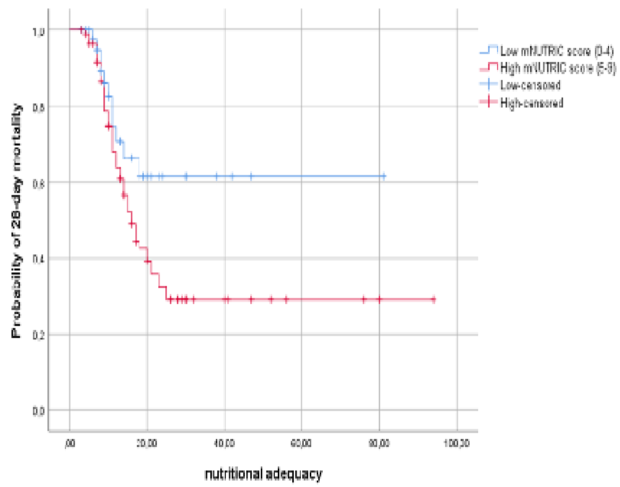

Figure 1. The 28-day survival of the patients classified according to the mNUTRIC score

Table 1. Patient characteristics according to 28-day mortality

	28-day patient results					
	Total Patients results (n:128)			Patients on mechanical ventilator (n:92)		
	Living (n:67)	Dead (n:61)	p	Living (n:38)	Dead (n:54)	p
Age, mean(SD)	57,5(14,1)	71,6(11,7)	0,368	57,5(14,1)	71,6(11,7)	0,174
Weight, kg, mean(SD)	74(12.4)	67,3(12,06)	0,227	74(12,4)	67,3(12,06)	0,772
Height, cm, mean(SD)	167,7(8,8)	159,4(9,04)	0,607	167,7(8,8)	159,4(9,04)	0,169
BMI, kg/m2, mean(SD)	25,8(3,7)	26,5(3,4)	0,107	25,8(3,7)	26,5(3,4)	0,247
mNUTRİC mean(SD)	4,7(0,9)	5,8(1,45)	<0,001	4,75(1,45)	5,8(1,45)	0,002
Hospital to ICU admission	5(2,7-8)	10(5,5-12,5)	0,122	5,5(2,75-12)	10(5,5-12,5)	0,31
days, median (IQR)						
LOS in ICU, days	16(8-30)	11(8,5-15.5)	0,024	19,5(9-32)	11(9-15,2)	0,006
Median (IQR)						
Mechanical ventilationn (%)	38(43,4)	54(48,6)	0,363			
Baseline APACHE II mean(SD)	18(2,7)	27(11,05)	<0,001	18(2,7)	27(11.05)	<0,001
SOFA mean(SD)	6,25(0,5)	7,7(2,48)	<0,001	6,25(0,5)	7,7(2.4)	<0,001
mNUTRİC scor			<0,001			0,003
Low(%)	32(74.4)	11(25.6)		19(65,5)	10(34,5)	
High(%)	35(41.2)	50(58.8)		19(30,2)	44(69,8)	
RRT	9(25,7)	26(74,3)	<0,001	6(21,4)	22(78,6)	0,012
Vasopressor n(%)	10(29.4)	24(70,6)	0,002	5(19,2)	21(80,8)	0,009
Diagnosis n(%)			0,011			0,174
Cardiovascular disease	6(66,7)	3(33.3)		3(50)	3(50)	
Sepsis	22(40)	33(60)		15(33,3)	30(66,7)	
Airway disease	12(75)	4(25)		5(62,5)	3(37,5)	
Endocrine & metabolic disease	10(90.9)	1(9,1)		5(83,3)	1(16,7)	
Malignant disease	5(33.3)	10(66,7)		5(35,7)	9(64,3)	
Neurological disease	7(50)	7(50)		2(25)	6(75)	
Others	5(62.5)	3(37.5)		3(60)	2(40)	

Table 2. Relation of caloric adequacy to clinical results.

	AllPatients (n:128)	Calorieadequacy>%70 (n:98)	Calorieadequacy<%70 (n:30)	p
Intensivecare				
timedays	12,5(8-20,7)	11(8-20)	9,5(8,7-26)	0,435
median(IQR)				
28-daymortality	61(47,7)	42(42,9)	19(63,3)	0,061
Hospitaltointensive	6(5-10)	10(3-14)	5,5(5,7-10)	0,644
Careadmissiondays, median(IQR)				
Mechanicalventilation	10(5-13)	11(7-15)	7,5(5-11)	0,042
day,median(IQR)				
mNUTRIC skor	5(4-6)	6(4-8)	5(4,75-6)	0,209

No significant difference was determined between the groups with <70% or >70% intake of daily calorie requirement in respect of length of stay in intensive care unit, length of hospitalization before admission to intensive care unit, mNUTRIC score, and 28-day mortality (p>0.05). The median length of time on MV was determined to be significantly longer in the group receiving >70% energy (p<0.05). The comparisons of length of stay in the intensive care unit, 28-day mortality, length of hospitalization before admission to ICU, and duration of MV requirement according to energy intake are shown in Table 2.

Discussion

In this study, we aimed to investigate the effect of mNUTRIC score on 28-day mortality in critically ill patients admitted to our intensive care unit. The results of the survival analysis demonstrated a relationship between mNUTRIC score, vasopressor drug use and RRT and 28-day mortality in all patients and those with MV support.

Wang et al compared a high NUTRIC score with those with a low NUTRIC score, and reported higher mortality rates in patients with high NUTRIC scores [10].

The mNUTRIC score may be helpful in identifying patients who will gain the most benefit from nutritional support [9,11].

It has been reported that the majority of severe COVID-19 patients with mNUTRIC scores of high nutritional risk and patients at high nutritional risk admitted to ICU have a significantly higher 28-day mortality rates compared to those at low nutritional risk [12].

Similarly, in the current study, 28-day mortality was determined to be significantly higher in patients with a high mNUTRIC score than in patients with a low mNUTRIC score. The optimal amount of nutritional support to obtain the maximum benefit in critical patients remains a matter of debate. Observational studies have reported a relationship between full calorie intake in critically ill patients at high nutritional risk and better outcomes [8,9].

While some studies have shown improved patient outcomes associated with optimal nutrition [13,14], others have reported no significant effect [15,16].

There are also studies reporting that critical patients with adequate nutrition did not benefit significantly from nutritional support [8].

As the heterogeneity of patients in ICU, and the differences in disease severity and organ failure mean that not all patients will respond equally to nutrition therapy, it can be considered that it would be most useful to provide nutritional support on an individual patient basis.

Jung et al reported that in the group with a high mNUTRIC score, 30-day mortality was higher in patients with insufficient calorie supplementation (calorie sufficiency <70%) compared to those with sufficient supplementation, but this was not observed in patients with low mNUTRIC scores [17].

Zusman et al stated that patients with 70% target calories had better outcomes than patients with optimal nutrition (receiving 100% target calories), and intake of >70% calories was associated with a longer stay in ICU and a longer duration of MV [18]. In the current study, there was no statistically significant difference in 28-day mortality rates between the critical patients receiving >70% of the target calorie requirement and the patients receiving <70%, but the time on MV was significantly longer in the >70% group (p:0.04). In the INTACT study, higher calorie intake was reported to increase mortality in patients with acute liver damage [19]. This can be explained by high calorie intake increasing the respiratory workload and therefore prolonging the time to weaning from ventilation.

There were some limitations in this study, primarily that it was retrospective and conducted in a single centre, and that the low number of patients prevents generalization of the results. Furthermore, although an indirect calorimeter is ideal for the calculation of the energy requirement of an individual, this was not available throughout the study. Therefore, as an alternative, a formula using the ideal body weight of each patient was used for the calculation of energy required. A further limitation was that protein sufficiency, which can affect clinical results, was not taken into consideration.

Conclusion

The results of this study demonstrated that high mNUTRIC scores in ICU patients are associated with 28-day mortality. Patients on MV receiving >70% of the calorie requirement spent more days on MV than those receiving <70%. Despite the energy target of 100% of the calculated energy requirement remaining the ideal target, further studies using an indirect calorimeter to calculate the real-time energy requirement in ICU may be useful to confirm the outcomes of this study.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Funding: *None*

Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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How to cite this article:
***Semiha Orhan, Kemal Yetiş Gulsoy.** Relationship between mNUTRIC score and 28-day mortality in critical patients. Ann Clin Anal Med 2022;13(6):669-673*